IN THE CLAIMS:

Please amend the claims as indicated below.

1. (Amended) A method for improving the physical and mechanical properties of ion-conducting materials, comprising:

providing an ion conducting base material;

providing a crosslinking agent; and

incorporating the crosslinking agent into the ion-conducting base material through hydroxyl and sulfonic acid condensation or ~~though~~ through amine and sulfonic acid condensation.

2. (Previously Presented) A method as in claim 1, wherein the incorporation takes place in a non-aqueous environment.

3. (Previously Presented) A method as in claim 1, wherein the crosslinking agent has a chain that includes an aromatic polymer chain, an aliphatic polymer chain, an organic or inorganic polymer network, or any combination thereof.

4. (Previously Presented) A method as in claim 1, wherein, in addition to one or more of amine, hydroxyl, or sulfonic acid groups, the crosslinking agent has at least one functional group to form a covalent crosslinking bond with the ion conducting base material.

5. (Previously Presented) A method as in claim 1, wherein the ion conducting base material is an organically-based material, an inorganically-based material, or a composition thereof.

6. (Previously Presented) A method as in claim 1, wherein the ion conducting base material is organically based and containing aromatic or aliphatic structure.

7. (Previously Presented) A method as in claim 6, wherein the aromatic structure includes poly-aryl ether ketones and poly-aryl sulfones.

8. (Previously Presented) A method as in claim 6, wherein the aliphatic structure includes perflourinated or styrene co-polymer types

9. (Previously Presented) A method as in claim 1, wherein the ion conducting base material contains one or more inorganic additives.

10. (Previously Presented) A method as in claim 9, wherein the inorganic additive is selected from the group consisting of clay, zeolite, hydrous oxide, and inorganic salt.

11. (Previously Presented) A method as in claim 10, wherein the clay includes an aluminosilicate-based exchange material selected from the group consisting of montmorillonite, kaolinite, vermiculite, smectite, hectorite, mica, bentonite, nontronite, beidellite, volkonskoite, saponite, magadite, kenyaite, zeolite, alumina, rutile.

12. (Previously Presented) A method as in claim 1, wherein the ion conducting base material has a given molecular weight and/or polymer structures with functional groups that include sulfonic acids, phosphoric acids, carboxylic acids, imidazoles, amines, and amides.

13. (Previously Presented) A method as in claim 1, wherein the crosslinking agent is hydroxyl terminated and the ion conducting base material is sulfonated, and wherein the incorporation includes direct covalent crosslinking between the hydroxyl terminated crosslinking agent and the sulfonated ion-conducting base material such that their reaction is in the form of

$$\text{HO-R}_1\text{-OH} + 2(\text{HSO}_3)\text{-R}_2 \rightarrow \text{R}_2\text{-SO}_2\text{-O-R}_1\text{-O-SO}_2\text{-R}_2 + 2\text{H}_2\text{O}$$

where R_1 is the hydroxyl terminated crosslinking agent's main chain and R_2 is the sulfonated ion conducting base material.

14. (Previously Presented) A method as in claim 13, wherein the main chain includes one or more chains selected from a group consisting of an aromatic polymer chain, an aliphatic polymer chain, organic molecules and inorganic molecules.

15. (Previously Presented) A method as in claim 13, wherein the sulfonated ion conducting base material includes, one or more chains selected from a group consisting of an aromatic polymer chain, an aliphatic polymer chain, organic molecules and inorganic molecules.

16. (Previously Presented) A method as in claim 1, wherein the crosslinking agent is amine terminated and the ion conducting base material is sulfonated, and wherein the incorporation includes direct covalent crosslinking between the amine terminated crosslinking agent and the sulfonated ion-conducting base material such that their reaction is in the form of

$$H_2N\text{-}R_1\text{-}N\text{-}H_2 + 2(HSO_3)\text{-}R_2 \rightarrow R_2\text{-}SO_2\text{-}NH\text{-}R_1\text{-}NH\text{-}SO_2R_2 + 2H_2O$$

where R_1 is the amine terminated crosslinking agent's main chain and R_2 is the sulfonated ion conducting base material.

17. (Previously Presented) A method as in claim 1, wherein the crosslinking agent is sulfonic acid terminated and the ion conducting base material is amine or hydroxyl terminated, and wherein the incorporation includes direct covalent crosslinking between the sulfonic acid terminated crosslinking agent and the amine or hydroxyl terminated base ion-conducting material such that their reaction is in the respective form of

$$HO_3S\text{ -}R_3\text{- }SO_3H + 2(HO)\text{-}R_4 \rightarrow R_4\text{-}SO_2\text{-}O\text{-}R_3\text{-}O\text{-}SO_2R_4 + 2H_2O$$

or

$$HO_3S\text{ -}R_3\text{- }SO_3H + 2(H_2N\ )\text{-}R_4 \rightarrow R_4\text{-}SO_2\text{-}NH\text{-}R_3\text{-}NH\text{-}SO_2R_4 + 2H_2O$$

where R_3 is the sulfonic acid terminated crosslinking agent's main and R_4 is the amine or hydroxyl terminated ion conducting base.

18. (Previously Presented) A method as in claim 1, wherein incorporation involves a reaction solvent, including a high boiling point, non-polar solvent selected from a group consisting of dimethyl sulfoxide (DMSO), n-methyl pyrrolidinone (NMP), dimethyl acetamide (DMAC) and dimethylformamide (DMF).

19. (Previously Presented) A method as in claim 1, wherein incorporation proceeds under

azeotrophic distillation via a removal of water by toluene to facilitate reaction kinetics.

20. (Previously Presented) A method as in claim 1, wherein incorporation involves 0.1% to 8% crosslinking agent's molar equivalents with respect to ion conducting base material's sulfonic acid sites.

21. (Previously Presented) A method as in claim 1, wherein incorporation involves 0.1% to 8% crosslinking agent's molar equivalents with respect to ion conducting base material's amine or hydroxyl group sites.

22. (Previously Presented) A method as in claim 1, wherein the ion conducting base material contains an inorganic cation exchange material.

23. (Previously Presented) A method as in claim 22, wherein the inorganic cation exchange material is selected from a group consisting of clay, zeolite, hydrous oxide, and inorganic salt.

24. (Previously Presented) A method as in claim 22, wherein the inorganic cation exchange material further includes a silica based material and a proton conducting polymer based material.

25. (Amended) A method for adding functionality to ion-conducting materials, comprising

providing an ion conducting based material;

providing a [modified] crosslinking agent; and

incorporating the modified crosslinking agent into the ion-conducting base material through hydroxyl and sulfonic acid condensation or ~~though~~ through amine and sulfonic acid condensation.